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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,488	07/25/2003	David M. Dobuzinsky	FIS920030083US1	1487

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INTERNATIONAL BUSINESS MACHINES CORPORATION  
DEPT. 18G  
BLDG. 300-482  
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HOPEWELL JUNCTION, NY 12533

EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 10/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/604,488	DOBUZINSKY ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Anh D. Mai	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 25 July 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 11-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>7/25/2003</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. During a telephone conversation with Mr. Steven Capella, Reg. No. 33,086 on October 5, 2004 a provisional election was made without traverse to prosecute the invention of Group I, claims 1-10. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-19 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

### ***Specification***

2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

TRENCH CAPACITOR HAVING Si-C BARRIER LAYER BETWEEN  
CONDUCTIVE STRAP AND SEMICONDUCTOR SUBSTRATE.

### ***Drawings***

4. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "Si-C barrier layer is located at an

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interface between said trench electrode and said conductive strap" (as recited in claim 3) and "interface is located below a vertical transistor" (as recited in claim 5) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. Evidence that the pending claims

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fail(s) to correspond in scope with that which applicant(s) regard as the invention can be found in the specification and drawing, Fig. 3. In the specification and drawing, applicant has stated the SiC layer 58 or 158 is formed between the strap 56 or 156 and the semiconductor substrate 60, and this statement indicates that the invention is different from what is defined in the claim(s) because claim 1, lines 8-9, recites: "(v) a Si-C barrier layer between said monocrystalline substrate and said trench electrode".

Note that, the strap and the trench electrode are two distinct components. (See (iv)).

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-7, 9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Tsunashima et al. (U.S. Patent No. 6,326,658).

With respect to claim 1, as best understood by the examiner, Tsunashima teaches a deep trench capacitor in a monocrystalline semiconductor substrate as claimed including:

(i) a buried plate (6) in the substrate (1) about an exterior portion of a trench (3) in the substrate (1);

(ii) a node dielectric (7) about at least a lower interior portion of trench (3);

(iii) a trench electrode (8) in the trench (3); and

(iv) a conductive strap (11) extending away from the trench electrode (8), the conductive strap (11) being electrically connected to the trench electrode (8) and the monocrystalline substrate (1),

the capacitor further comprising:

(v) a Si-C barrier layer (10) between the monocrystalline substrate (1) and the trench electrode (8) or the strap (11). (See Fig. 1).

With respect to claim 2, capacitor of Tsunashima further comprises an oxide collar (9) about an upper interior region of the trench (3) and disposed below the conductive strap (11).

With respect to claim 3, the Si-C barrier layer (10) of Tsunashima is located at an interface between the trench electrode (8) and the conductive strap (11).

With respect to claims 4 and 10, the Si-C barrier layer (10) of Tsunashima is located at an interface between the conductive strap (11) and the monocrystalline substrate (1).

With respect to claim 5, the interface of Tsunashima is located below a vertical transistor.

With respect to claim 6, the Si-C barrier layer (10) of Tsunashima has a thickness of about 10nm.

With respect to claim 7, the conductive strap (11) of Tsunashima is a buried strap.

With respect to claim 9, the trench electrode (8) of Tsunashima comprises doped polycrystalline silicon.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsunashima '658 as applied to claim 1 above, and further in view of Chaloux et al. (U.S. Patent No. 6,194,736) of record.

Tsunashima teaches the buried strap 11 can be formed by filling an amorphous silicon film in trench 3 and changing the amorphous silicon film into a polysilicon film.

Thus, Tsunashima is shown to teach all the features of the claim with the exception of using amorphous silicon for the conductive strap.

However, Chaloux teaches that the buried strap or surface strap using amorphous silicon are well known in the art. (See col. 1, lines 26-41).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to use amorphous silicon for the conductive strap of Tsunashima as taught by Chaloux without departing from the scope of the invention.

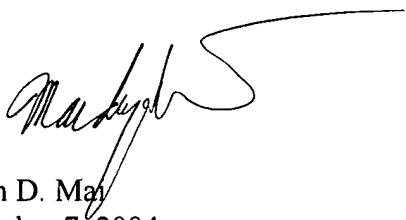
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 9:00AM-5:00PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Anh D. Mai', with a long, sweeping horizontal line extending to the right.

Anh D. Mai  
October 7, 2004